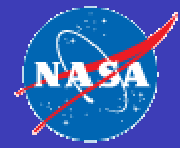
National Aeronautics and Space Administration



Improvements in Calibration and Retrievals for OH and HO_2

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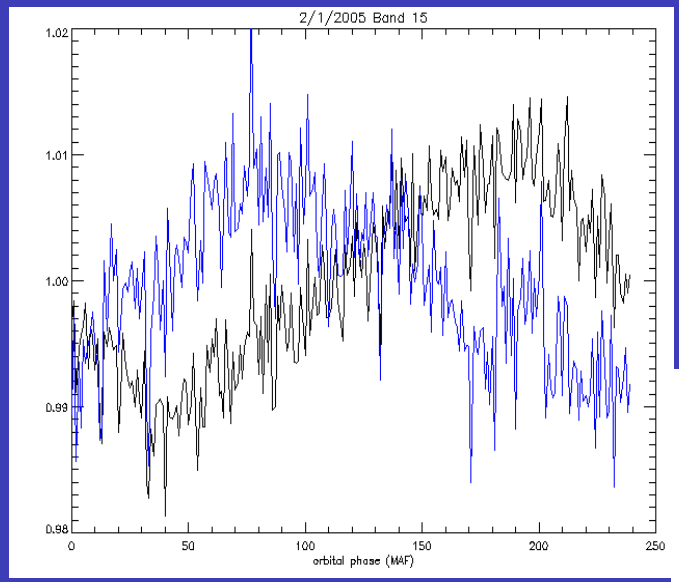
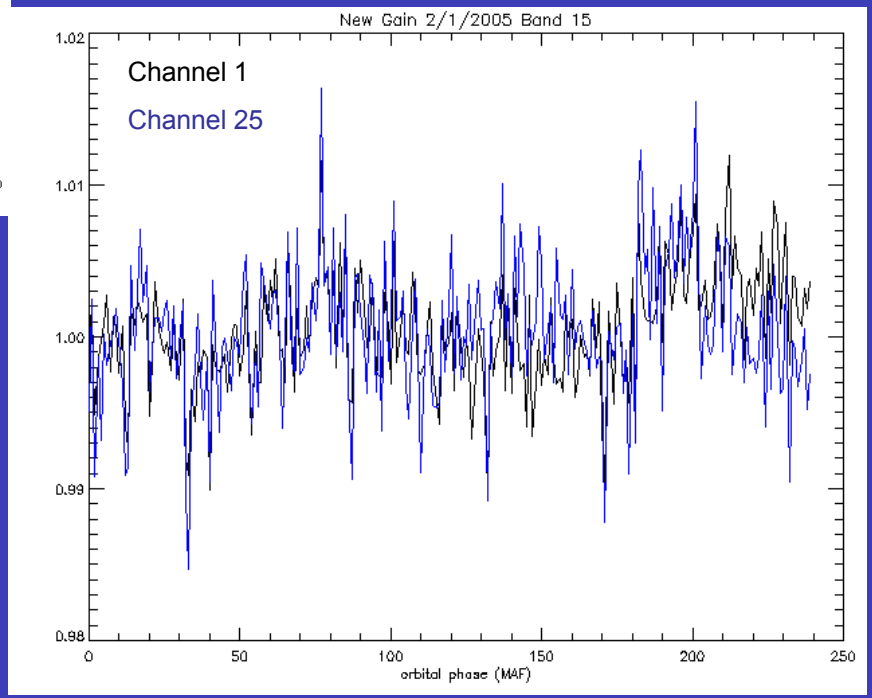
Aura Science Team Meeting, 9/06

THz Level 1b Calibration Changes

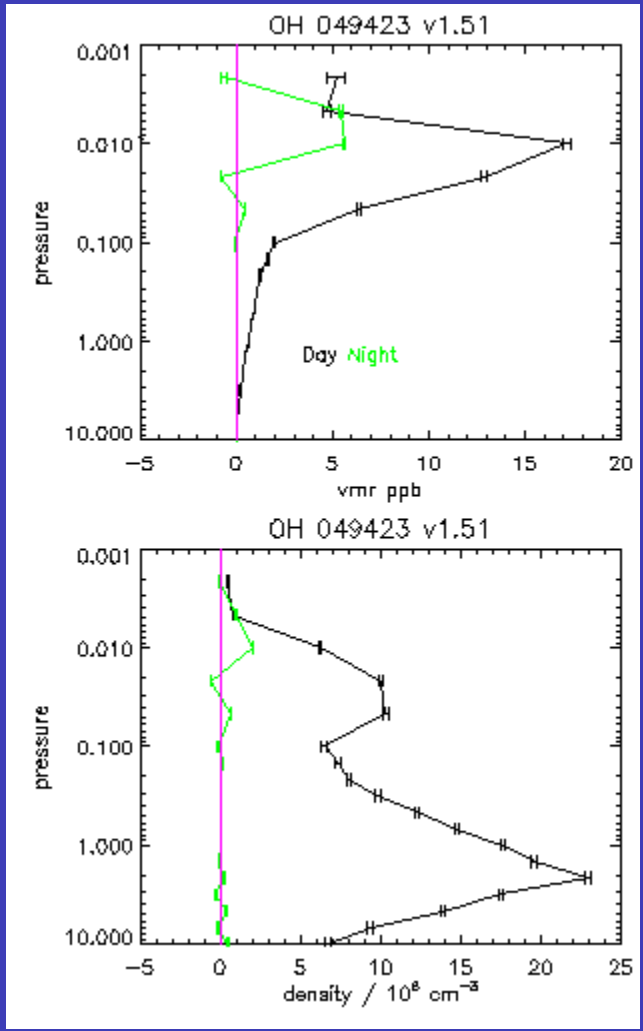
	OLD (V1.5X)	NEW (V2.1)
Phase 1: Fit DLLO and Gain for orbit sized time intervals. Output has T(A) units, but Tsys not yet removed. (DLLO is ~300K for 10% LLO power change.)	Divide day into 14 intervals. When intervals are not synchronized with LLO relock there are large changes in radiance at the interval boundary. Gain is assumed constant for each interval. (2 parameter fit for each channel.)	Divide day into intervals of 230-240 MAFs with LLO relock at interval boundary. Last two intervals overlap but are both full length. Gain has sin(Φ) and cos(Φ) dependence with Φ = 2π / (number of MAFs). (4 parameter fit for each channel.)
Phase 2: Remove zeros. Output is fully calibrated radiance.	Use both cold and target views to determine zeros by quadratic interpolation similar to GHz procedure. Using target views improves precision, but gain errors have effect for cold views as well as warm views.	Use only cold views to determine zeros by quadratic interpolation. Precision is reduced, but errors in gain have little effect for views with ~0K and 4/3 the effect for continuum [T(A) = ~160K vs. 240K for target].
Fault recognition	Test (1) LLO power and (2) presence of cold view at specified angle	Test (1) LLO power, (2) presence of cold view, (3) moon in cold view, (4) absolute Yaw angle less than 1 degree, and (5) radiance in range .

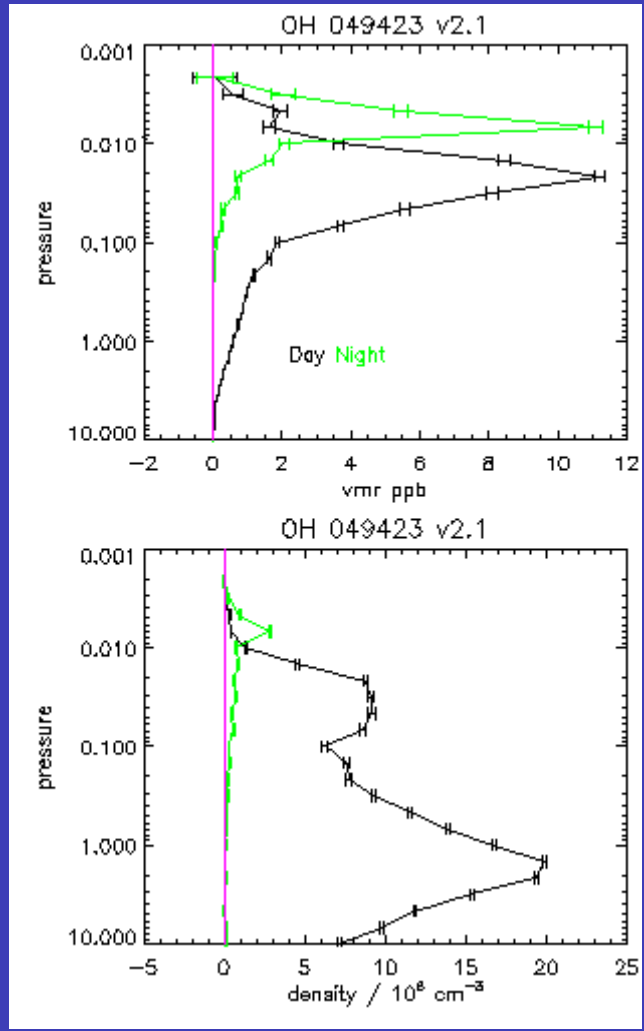

2/1/2005 Band 15
1.02
1.01
1.00
0.99
0.98
0
50
100
150
200
250
orbital phase (MAF)


New Gain 2/1/2005 Band 15
Channel 1
Channel 25
1.02
1.01
1.00
0.99
0.98
0
50
100
150
200
250
orbital phase (MAF)

THz Level 2gp Retrieval Changes

	OLD (V1.5X)	NEW (V2.1)
Vertical Resolution	3 / decade above 0.1 hPa (64 km) and 6 / decade below. OH Profiles frequently had negative excursions far in excess of precision.	Uniformly 6 / decade. OH profiles are smoother and have fewer negative excursions. Retrieval needed extra degrees of freedom to fit radiances.
Convergence limits	Iteration limit was 4. Not all fits converged.	Iteration limit set to 8. Many more fits converge.
Fault recognition	Did not always recognize bad radiances	Code and configuration fixed so that bad radiances are handled better.

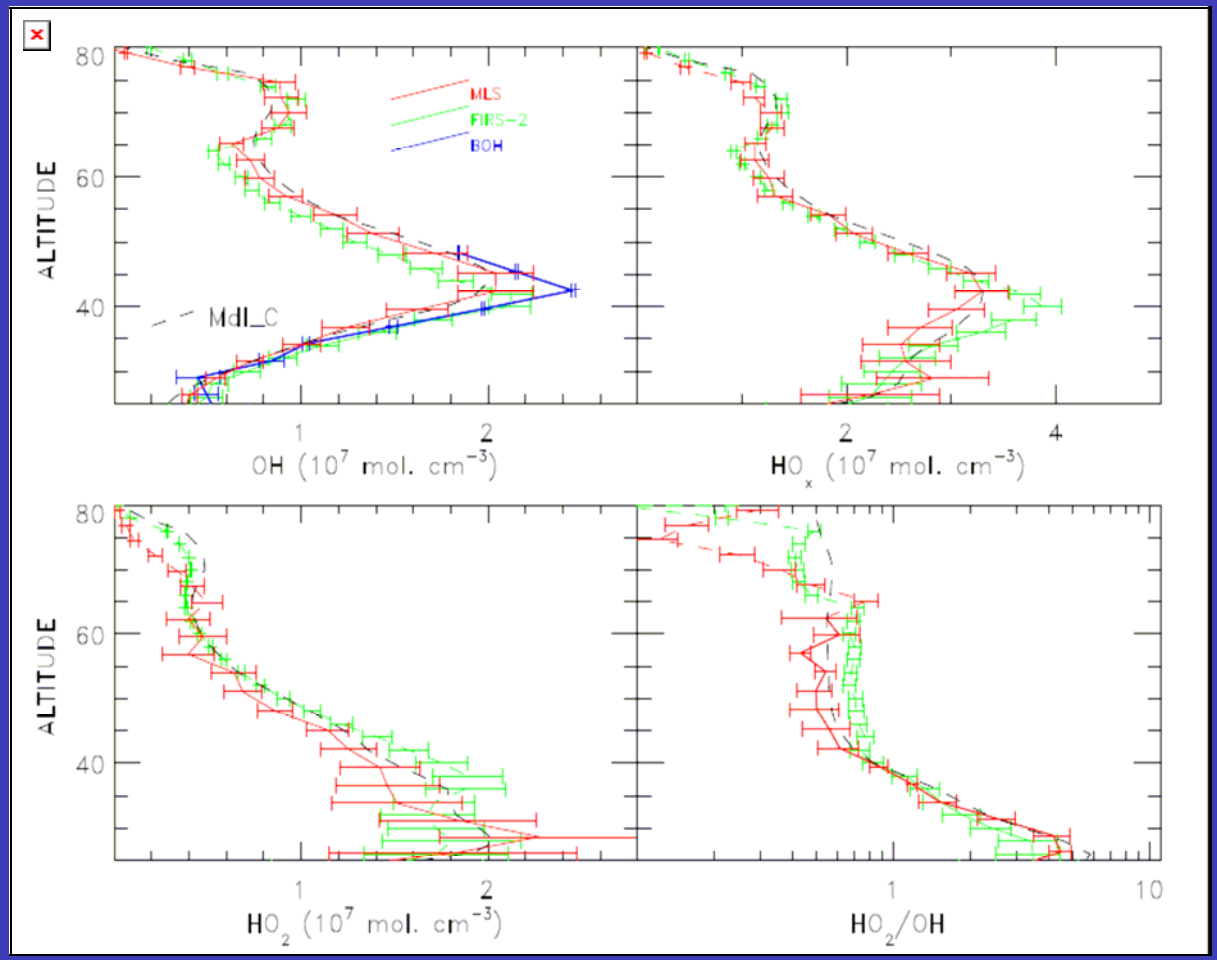

OH 049423 v1.51
pressure
0.001
0.010
0.100
1.000
10.000
Day Night
−5 0 5 10 15 20
vmr ppb
OH 049423 v1.51
pressure
0.001
0.010
0.100
1.000
10.000
−5 0 5 10 15 20 25
density / 10^8 cm^-3


OH 049423 v2.1
pressure
0.001
0.010
0.100
1.000
10.000
Day Night
−2 0 2 4 6 8 10 12
vmr ppb
OH 049423 v2.1
pressure
0.001
0.010
0.100
1.000
10.000
−5 0 5 10 15 20 25
density / 10^8 cm^-3

HO_2 Changes

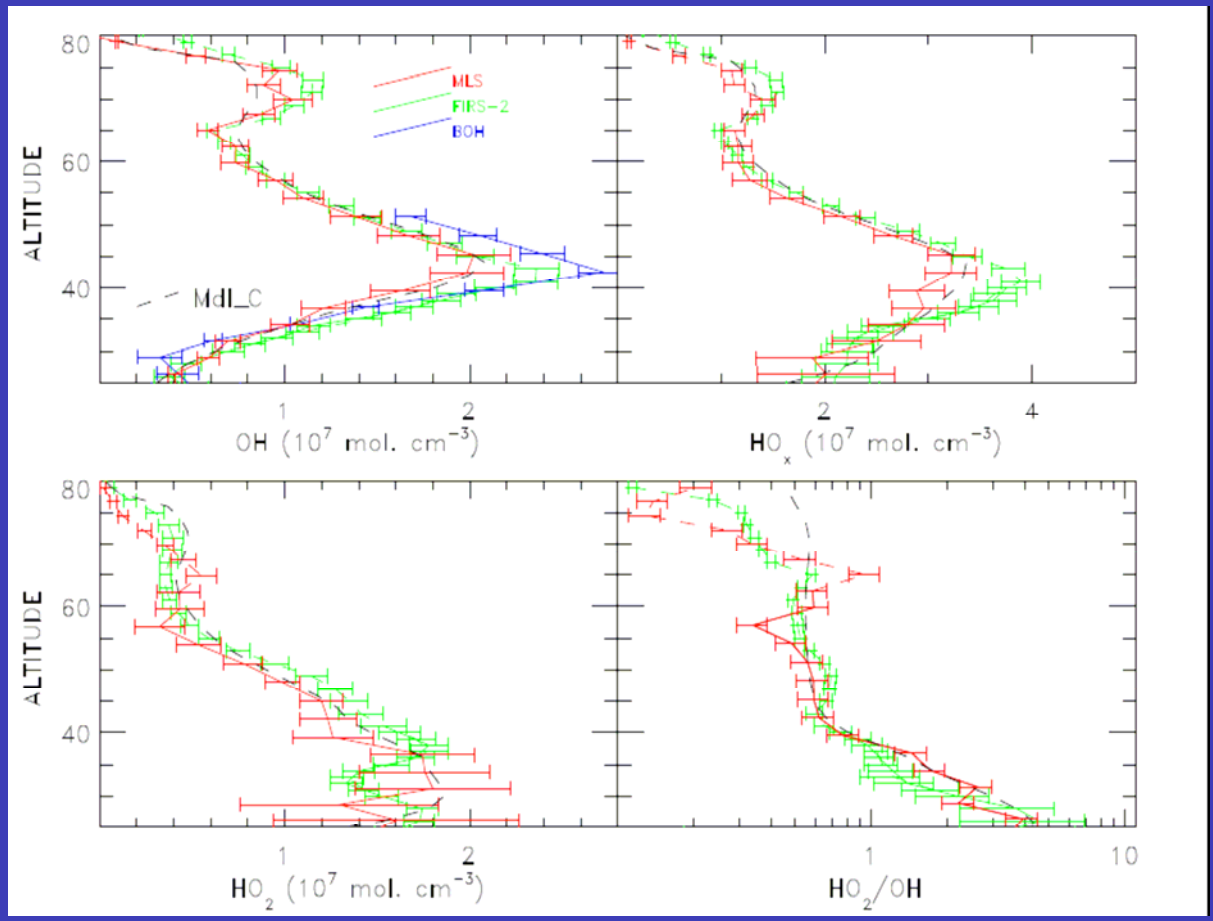
	OLD (V1.5X)	NEW (V2.1)
Vertical Resolution	3 / decade above 0.1 hPa (46 km) and 6 / decade below. HO2 profiles are jagged. Negative precision flag on above 0.1 hPa	Resolution unchanged. Tikhonov smoothing to 5 km FWHM in vertical and 3 profiles (4.5 degrees) FWHM in horizontal. Need to implement negative precision flag that works correctly in presence of smoothing

HOx for Sept 23, 2004



- Mdl_C is JPL02 kinetics, Smith & Stewart O+OH, and a 20% increase in $OH+HO_2$
- OH is zonal average over lat = [24,44]
- HO_2 is zonal average over lat = [-60,60] for 2 days

HOx for Sept 20, 2005



- Mdl_C is JPL02 kinetics, Smith & Stewart O+OH, and a 20% increase in $OH+HO_2$
- OH is zonal average over lat = [24,44]
- HO_2 is zonal average over lat = [-60,60] for 2 days